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NEW OPPORTUNITIES FOR SOLAR THROUGH GRID MODERNIZATION

How California & New York are Building Grids that Encourage the Growth of Distributed Energy Resources

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EXECUTIVE SUMMARY

Lawmakers and utility regulators in California and New York have been extensively engaged in efforts to modernize the electric distribution grid. This paper draws on the experience of Solar Energy Industries Association (SEIA) staff in each jurisdiction and explains how these efforts are creating new opportunities for solar power.[1] The paper describes the policy and political landscape in each state and summarizes the ways in which regulators are currently addressing grid modernization. We identify common elements of these efforts, which include: 1) updating utility system planning; 2) identifying alternatives to traditional utility investments; 3) establishing robust cost benefit frameworks; 4) modifying compensation frameworks to drive investments in distributed energy resources (DER), and 5) making utility investments in technologies that bring new functionality to the grid itself. Future papers will drill down into the details of these issues and discuss the pace of change, whether grid modernization efforts are bearing fruit, and obstacles to implementation.

INTRODUCTION TO GRID MODERNIZATION

For decades, electric distribution utilities have been upgrading their systems with new capabilities and better equipment to make their systems safer, more reliable and less costly to operate. But with more customers than ever producing their own clean power with solar and other DER, energy regulators, electric utilities and solar firms are now faced with new operational conditions as well as new opportunities.

ABOUT THIS WHITEPAPER SERIES

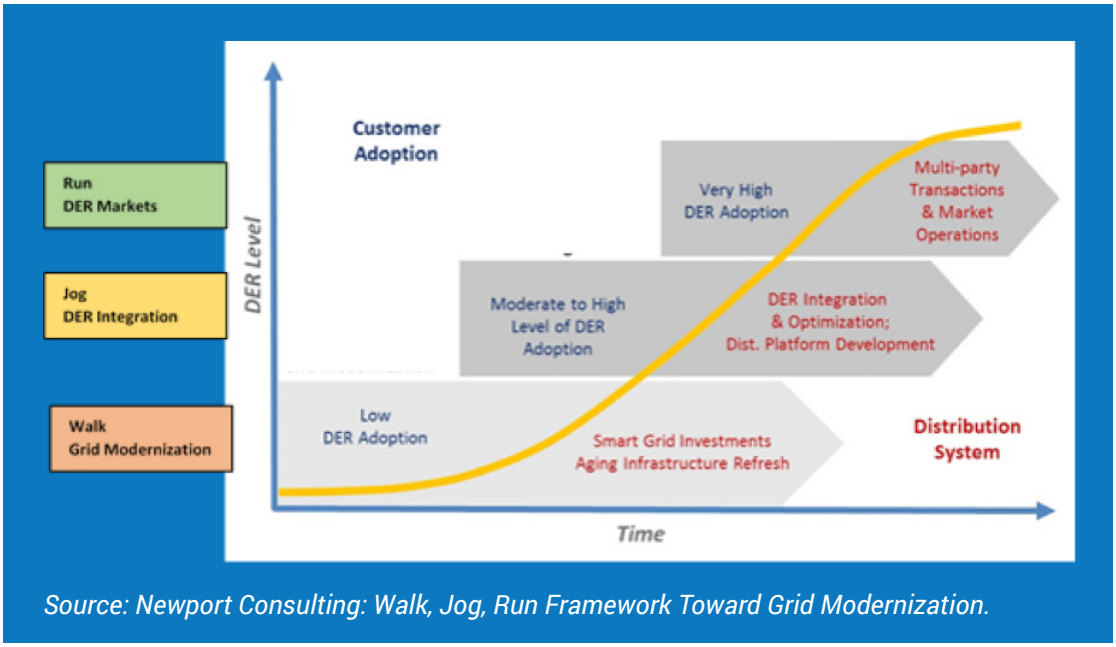
This series of SEIA policy briefs takes an in-depth look at state-level efforts to modernize the electric utility grid. Built during the last century, the United States electric grid was primarily designed to transport electricity from central station power plants to end-use customers. But with rapid growth of distributed energy resources such as solar, customers are increasingly taking charge of their own energy. Today's electric grid must allow distributed energy technologies to flourish and provide reliable, low-cost power for consumers. Distributed energy resources, like solar, can also provide power where it is needed most and help avoid investments that a utility would otherwise need to make.

This series explores the elements of electric grid modernization, compares the ways in which two leading states are tackling these issues, and discusses how these efforts are creating new opportunities for solar power. Grid modernization efforts in states present significant risks and opportunities for solar. These efforts will determine how much new solar and other distributed energy resources can interconnect to the grid, identify areas where solar can provide grid services in lieu of utility investments, and in some states, will shape the future of net energy metering.

[1] SEIA's state affairs team is actively involved in proceedings in these two states, and has filed comments individually and as part of coalitions on key aspects of grid modernization dockets, and regularly engages with regulators on these and other issues.

The grid must be enhanced to encourage the widespread use of clean distributed energy resources, such as solar power. Grid upgrades must also be executed in a way that allows ratepayers to save money versus business-as-usual utility spending on distribution infrastructure. New value and compensation frameworks must also be created to facilitate the deployment of DER in strategic locations that can yield benefits to ratepayers.

Thus, energy regulators across the country, have started a host of dockets to consider changes to utility practices. California and New York have made considerable progress. But even with progress being made on the coasts, regulators and utilities are still in the earliest stages of modernizing the grid. As colleagues at More than Smart have described the process of creating a more modern grid, even leading states are still in the walking phase of More than Smart's walk, jog, run framework. Shown in the figure, even leading states haven't hit the ground running. We describe state efforts in California and New York below.



Source: Newport Consulting: Walk, Jog, Run Framework Toward Grid Modernization.

GRID MODERNIZATION IN CALIFORNIA

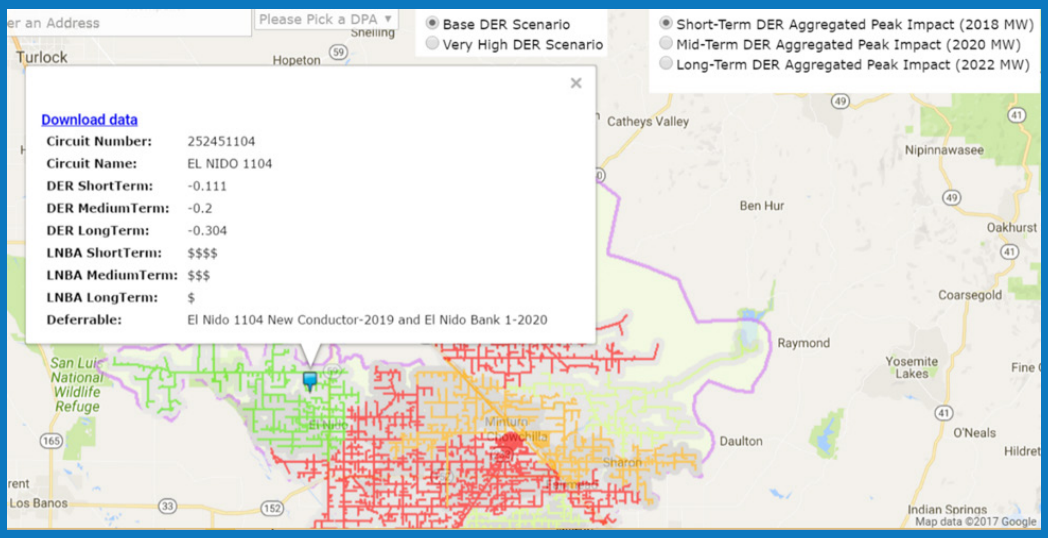
Passed in 2013, Assembly Bill 327 launched a series of regulatory proceedings that will profoundly shape California's solar market, the largest in the country. The bill instructed the California Public Utilities Commission (CPUC) to undertake comprehensive residential rate reform for the first time since the energy crisis at the turn of the millennium, and move customers, on at least a default basis, to time-of-use rates by the end of the decade. This ambitious bill also tasked the CPUC with consideration of a NEM-successor tariff and review of utility Distribution Resource Plans.

[2] For most states DER penetrations are low enough that dramatic changes to grid capabilities and tariffs are unwarranted

[3] Resnick Sustainability Institute at the California Institute of Technology, "More than Smart; A Framework to Make the Grid More Open, Efficient and Resilient" (August 2014). Available at: http://morethansmart.org/wp-content/uploads/2015/06/More-Than-Smart-Report-by-GTLG-and-Caltech-08.11.14.pdf

In 2016, the CPUC retained full retail net metering provided that net metering customers: 1) pay non-bypassable charges on a gross- rather than net-basis; 2) pay a one-time interconnection fee; and 3) take service on a time-of-use rate.[4] The CPUC also signaled that it would revisit the net metering tariff beginning in 2019 after significant changes to rates came to a conclusion. Come 2019, the decision stated, the Commission would also have insights and tools from proceedings looking at revamping distribution system planning, operations, and investment.

The move to more location-specific valuation, and possibly location-specific compensation, is occurring in California's Integrated Distributed Energy Resources (IDER) Proceeding[5] and Distributed Resources Planning (DRP) Proceeding.[6] The DRP proceeding is developing a locational net benefit analysis (LNBA).



Locational Net Benefit Value "Heat Map" from PG&E's LNBA pilot

The LNBA is an evolution of the cost-effectiveness framework that the CPUC has used to evaluate distributed energy resources. Regulators have identified certain avoided costs that are "system level" values and do not vary by location across a utility service territory. They are also looking to improve and harmonize these system values through a process that is underway in the IDER proceeding. Transmission and distribution avoided costs, local capacity needs, and energy losses, which historically have been evaluated on a system-wide average basis will now vary at a much more geographically granular level: at the distribution planning area, substation level, or even circuit by circuit. Utilities are also evaluating other specific values such as voltage, power quality and reliability and resiliency and may add further values, such as asset life extension, data collection and situational awareness.

[4] California Public Utilities Commission, D.16-01-044, "Decision Adopting Successor to Net Energy Metering Tariff" (January 2016)

[5] California Public Utilities Commission, R.14-08-013 "Order Instituting Rulemaking on Distribution Resources Planning" (August 2014)

[6] California Public Utilities Commission, R.14-10-003 "Order Instituting Rulemaking on Integrated Distributed Energy Resources" (October 2014)

The locational net benefit analysis represents a significant step forward in providing transparency about utility distribution system needs that have the potential to be met by distributed energy resources in lieu of traditional utility equipment. However, questions remain over how values are calculated, particularly for services such as voltage management, which are not well valued by evaluating the ability of a DER to modify load. There are also questions about whether an avoided cost methodology is itself appropriate and how utility system needs should be identified when needs change within a utility's annual planning cycle.

GRID MODERNIZATION IN NEW YORK

New York's overall policy objectives set in the State Energy Plan are to obtain 50% of the state's electricity from renewables by 2030 and reduce greenhouse gas emissions by 40% from 1990 levels by the year 2030.[7] To realize these goals, New York launched the Reforming the Energy Vision (REV) effort at the New York Public Service Commission (PSC). REV is a multifaceted initiative that aims to reduce ratepayer surcharges, create new markets for energy and technology companies, update aging utility infrastructure at a lower cost than business as usual, create a grid that's less prone to outages, and reduce greenhouse gas pollution.[8]

As part of REV, the PSC also updated its benefit cost framework. The PSC selected the state's investor owned utilities as transactive grid operators and required them to prepare Distributed System Platform Implementation Plans (DSIPs) for transitioning to their new role. The PSC also required utilities to prepare a supplemental plan prepared jointly by all the utilities that proposed shared tools, processes and protocols to help operate a modern grid. The PSC directed the utilities to include adequate and reasonable assumptions about the uptake of DER in their load forecasts; provide third parties sufficient information to evaluate the best locations for solar systems; and describe a process for integrating cost effective DER at a system-wide scale. The initial DSIPs filed at the PSC included extensive analysis of utility grid operations.

The PSC has also pursued alternatives to utility investments through individual rate cases. In early 2014, the PSC required Consolidated Edison to make investments in distributed energy resources to avoid a $1 billion substation upgrade in Brooklyn/Queens.[9] Called the Brooklyn/Queens Demand Management (BQDM) effort, the PSC then directed the state's other investor owned utilities in their DSIP filings to identify similar areas where demand could be met with alternative investments.

> ***"A better understanding of the distribution grid will help solar projects, particularly by creating more certainty around the distribution system's ability to interconnect new systems at different locations."***

[7] New York State Energy Planning Board, "2015 New York State Energy Plan" (June 2015). Available at: https://energyplan.ny.gov/

[8] New York PSC, Case 14-M-0101, "Order Adopting Regulatory Policy Framework and Implementation Plan" (February 2016).

[9] New York State Public Service Commission, Case 14-E-0302 "Order Establishing Brooklyn/Queens Demand Management Program" (December 2014). Available at: http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=14-E-0302&submit=-Search+for+Case%2FMatter+Number

At approximately the same time the PSC also launched an effort to develop an interim and long-term tariff for solar systems, and other DER providers, that would send more accurate price signals than the ones sent through retail rate net energy metering. Called the Value of Distributed Energy Resources (VDER) proceeding, this case attempts to unbundle the various components of value contained in electric rates, including energy value, capacity value, environmental and locational value[10]. Although regulators recognized that they did not have the analysis to provide precise valuation, they established proxy values and a transition credit mechanism to estimate these values for the first phase of the tariff. A second phase of the proceeding will attempt to provide more accurate valuations.

THE COMMON ELEMENTS OF GRID MODERNIZATION

Although public utility commission discussions about modernizing the electric grid are unfolding in different ways, the elements of grid modernization include the following five main concepts: 1) updating utility system planning; 2) identifying alternatives to traditional utility investments; 3) establishing robust cost benefit frameworks, 4) modifying compensation frameworks to drive investments in DER, and 5) making utility investments in technologies that bring new functionality to the grid itself. We unpack these elements below.

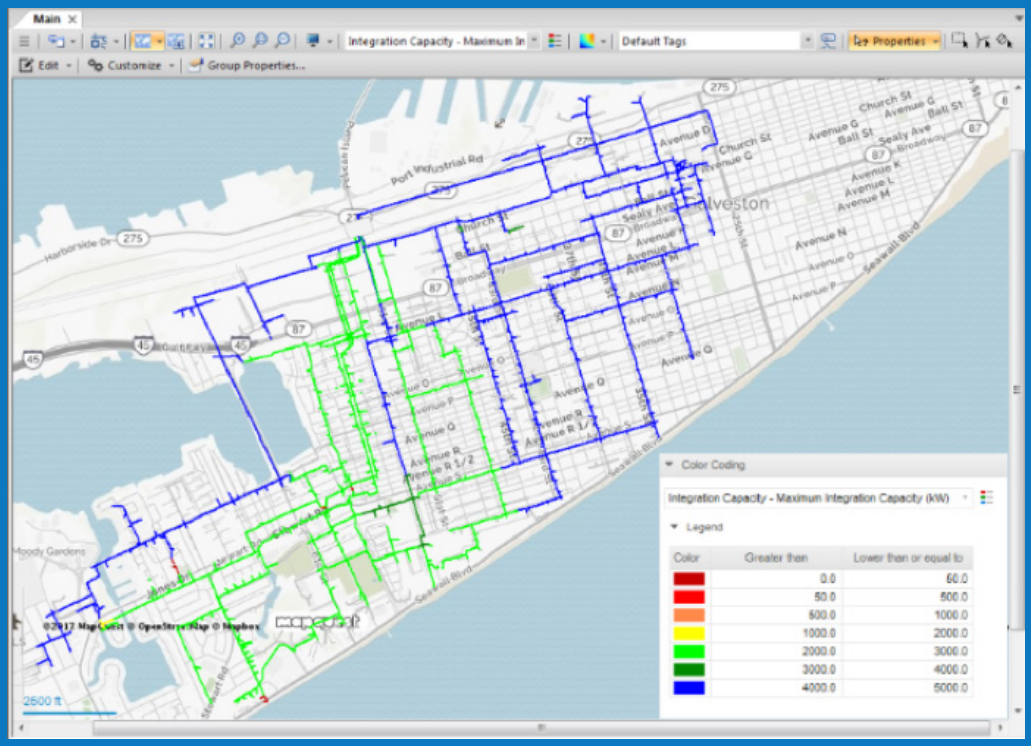
Updated Utility System Planning and Transparency

Arguably the foundation to all grid modernization efforts involves a fundamental shift in the way electric utilities plan to meet electric system needs. This planning should view all DER as an asset to the grid instead of a problem to be avoided, as it is sometimes perceived today.

A better understanding of the distribution grid will help solar projects, particularly by creating more certainty around the distribution system's ability to interconnect new systems at different locations. Currently developers of larger projects face uncertain prospects regarding interconnection costs and timing for their projects: will the developer need to pay for distribution system upgrades? How long will the interconnection process take? Better planning ultimately involves the utilities releasing more detailed analyses of system needs such as line-by-line analysis of the ability of the existing grid to incorporate solar systems, often referred to as hosting capacity analysis. This information should be made available more frequently, not simply as part of three-or-five -year capital improvement plans. Accurate and timely hosting capacity analyses should take a considerable amount of uncertainty and delay out of the interconnection process.

Better planning can also ensure that unnecessary utility investments are avoided and opportunities for DERs to provide "non-wires alternatives" are identified. Solar firms can help provide solutions to grid problems, once they know what the problems are and what the actual constraints of the grid look like. To enable these opportunities, utilities should make more information about utility system operations available to solar companies on a regular basis.

[10] New York State Public Service Commission, Case 15-E-0751 "Notice Soliciting Comments and Proposals on an Interim Successor to Net Energy Metering and of a Preliminary Conference" (December 2015). Available at: http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-E-0751&submit=Search+for+Case%2FMatter+Number

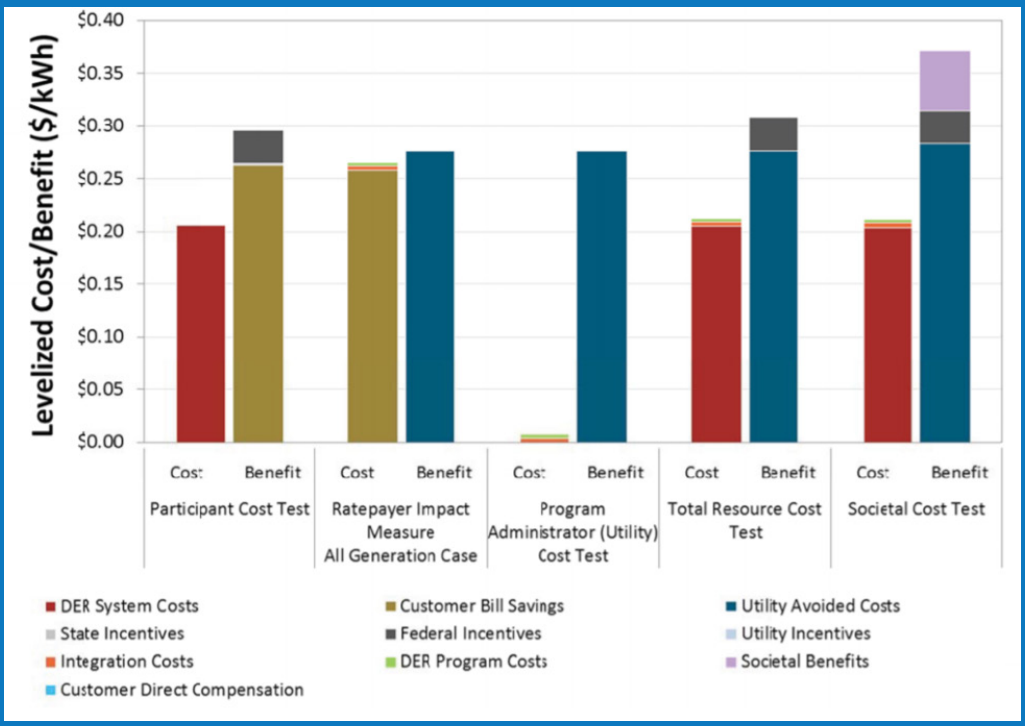


Example of hosting capacity analysis from software provider Eaton CYME

Establishing a Robust Benefit Cost Framework

Grid modernization efforts should also include establishment of a robust and transparent benefit cost framework to inform utility planning and ensure full and fair valuation of distributed energy resources vis-à-vis conventional utility investments. A benefit cost framework should take into consideration values including, but not limited to bulk system values, distribution system values, reliability and resiliency, and societal values. Additionally, the framework should consider costs associated with grid modernization efforts, including potential costs resulting from integrating DERs into the grid. The benefit cost framework can be used to place a value on DERs for the benefits they deliver, which may inform tariff development or solicitations of DERs on a portfolio basis.

> ***Once utility planners have published better ongoing data about system needs, utilities, regulators and solar firms can then identify strategic locations on the grid itself where traditional capital investments can be offset by DER alternatives.***



Cost Benefit Analysis from SEIA and Vote Solar's California Net Metering Proposal

Identifying Alternatives to Traditional Utility Investments

Pilot projects in New York, California, and elsewhere have sought DERs in lieu of more traditional grid upgrades. California used DERs to meet needs created by the unexpected closure of the San Onofre Nuclear Generating Station[11] and is repeating this process to meet needs in Santa Barbara[12]. New York is conducting a similar effort to avoid a distribution substation in Queens.[13]

Improved utility distribution planning can facilitate using NWAs at scale. Once utility planners have published better ongoing data about system needs, utilities, regulators and solar firms can identify strategic locations on the grid itself where traditional capital investments can be offset by DER alternatives. NWAs are a new opportunity for DERs that can save ratepayers money by avoiding costly upgrades to the distribution system by promoting demand side management solutions instead.

Modifying Value/Compensation Frameworks

Another element of grid modernization involves developing compensation frameworks or rate design reforms to encourage DER providers to build projects in strategic locations. This includes making valuation more locationally dependent, developing solicitations, rates, and tariffs to meet needs in areas of the distribution system with identified needs, and potentially modifying underlying tariffs. In areas with high levels of solar deployment modification of tariffs could include net metering.

[11] https://www.greentechmedia.com/articles/read/California-PUC-Looking-to-Replace-Closed-Nuclear-and-Outlawed-Gas-With-More

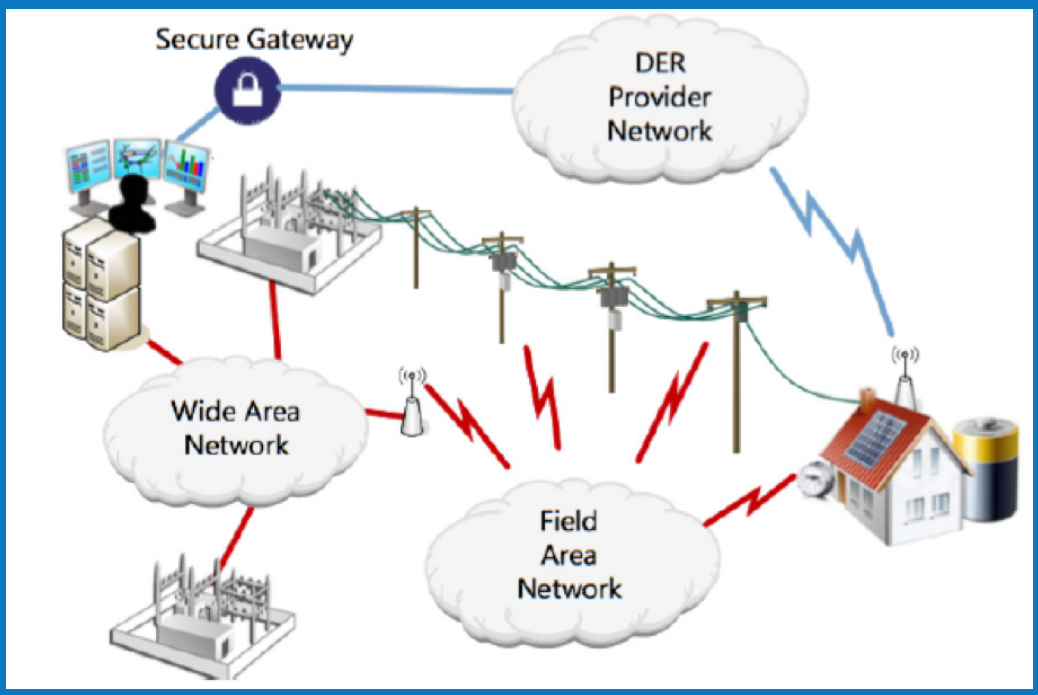
[12] Jeff St. John, SoCal Edison Seeks 55MW of Distributed Energy Resources to Keep Santa Barbara's Lights On, Greentech Media March 7, 2017 https://www.greentechmedia.com/articles/read/socal-edison-needs-to-keep-the-lights-on-with-distributed-energy

[13] http://www.utilitydive.com/news/coned-brooklyn-queens-non-wire-alternative-project-installs-first-microgrid/432380/

Updating the Functionality of the Grid Itself

The last element involves making improvements to the functionality of the grid itself. These investments in infrastructure may include monitoring technologies to help more easily identify areas of system constraints, they may provide more real-time data about system needs, technologies that allow DER to even out power flows, and metering infrastructure to provide more accurate and timely information about customer electricity usage as well as billing. Utilities across the country vary widely on the extent to which they use these tools.

In this area of grid modernization there is another balance between utility and DER investment. Utilities may need investments, like distributed energy resource management systems (DERMs). But there are also potential opportunities for DERs, particularly with the capabilities of smart inverters which can provide much more data than utility equipment and have the capability to help manage power quality on the distribution system.



Visualization of a DER communications and control network, Southern California Edison

CONCLUSION

Leading states are tackling grid modernization through different means, but the elements of the discussions are strikingly similar. Furthermore, grid modernization discussions have moved beyond thought exercises by academics and think tanks. In California and New York, public utility commissions have required the execution of significant pilot programs and have begun requiring utilities to provide new analysis and redesign rates to accomplish their objectives.

But are utilities providing enough useful information on system planning in these dockets? How are new rate designs contributing to efforts to add more distributed energy resources into a more transactive grid? Will these efforts keep their current momentum or bog down based on lack of financial motivation on the part of utilities to participate? We will dive into these questions in future papers.

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